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ABSTRACT

The widespread use of Information Technology (IT) in a college or university setting represents a significant change from traditional ways in which higher education has been conducted. Technological change has repercussions throughout the many dimensions of institutional life. This paper explores the impact of information technology on the structural, human resource, political, and cultural aspects of higher education. IT breaks down organizational barriers and barriers previously created by time and distance, creating new opportunities for distance learning which affect the structure of the academic department, social interaction, residential college life, and the nature of instruction. IT has the ability to increase and streamline communications between faculty, students, and administration, but can also present communication problems because of differing computer attitudes and skill levels. Universities must contend with political issues of resource allocation, financial constraints, and competition and cooperation with other schools. IT affects the culture of higher education by changing the key roles of faculty, students, and administration, and altering the distinctive cultural character of higher education institutions. Information technology creates new ways for doing existing work more efficiently, creates new work that did not previously exist, enhances education, and transforms the traditional ways in which we think about the process of higher education. (SWC)

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A Multidimensional Theoretical Analysis of the Impact of Information Technology on Higher Education

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A Multidimensional Theoretical Analysis of the Impact of Information Technology on Higher Education

The wide spread use of information technology (IT) in a college or university setting represents a significant change from traditional ways in which higher education has been conducted. Technological change has repercussions throughout the many dimensions of institutional life. This paper explores the impact of information technology on higher education by examining four of these dimensions. The conceptual framework for this paper is drawn from the work of Lee G. Bolman and Terrence E. Deal, (1991) whose book Reframing Organizations: Artistry, Choice and Leadership uses the structural, human resource, political and symbolic frames to explicate organizational theory.

What is Information Technology?

I center my discussion of IT on those instances where microcomputers are linked together by local and wide-area networks and to interactive video and telecommunication applications. I am referring to common interactive applications like electronic mail, newsgroups and listservs, the World Wide Web (WWW), and information repositories such as Ask Eric available on the Internet. Information technology includes real-time applications like Internet relay chat which enables users to communicate individually with colleagues all over the world. Information technology also includes computer multi-user domains and teleconferencing technology which enables groups of geographically dispersed people to interact in a classroom setting, thus making effective distance learning possible. Interoffice or classroom groupware applications which support collaborative work and learning are also included in the IT category.

The Age of Information Technology

The age of information technology in higher education is not only inevitable; it, in fact, has already begun. A recent survey of 250 colleges and universities taken by the American Association of University Professors showed that while almost all of the schools provide E-mail and Internet access, fewer than a quarter of the schools are currently using technology as a major component of classroom instruction (Elfin, 1996). All evidence suggests that the microcomputer classroom will eventually occupy a central role in college instruction. The American Council on Education surveying 407 colleges and universities in 1995 found that 68 percent of the schools have plans to introduce more electronic technology into the classroom (Simons,1996). Some institutions will resist technological changes or seek to impose limitations, but the impact is persuasive and unavoidable. Those colleges that resist or ignore technological changes or those colleges that simply can't accumulate the resources to purchase and support technology are already being measured—particularly by prospective students and their parents--against the schools that have embraced IT. Clearly most faculties and administrations believe that there is much to be gained by the use of IT—enhancing teaching, research, and service. There is also much that is already occurring that should cause concern if not alarm among faculties and administrators. I am not concerned here with resolving disagreements among advocates and proponents of technological change in higher education. I am not well suited to predict that information technology will bring about utopias or distopias in higher education. My purpose is rather to inform members of the higher education community of some select changes in colleges and universities, resulting primarily from IT, which may not be initially obvious. Bolman and Deal's four frame structure is especially useful for considering the impact of IT on institutions of higher learning from a broad perspective of alternative realities.

The Structure of Higher Education and Information Technology

Information technology breaks down barriers previously created by time and distance. It also breaks down organizational barriers, by-passing most institutional and governmental barriers to teaching and learning. Web-site based courses can theoretically be accessed at any time by any person. The organization of the institution of higher learning as an autonomous unit that has an exclusive privilege to educate its students is quickly becoming a thing of the past. Many colleges are already cooperating to provide an expanded curriculum through the use of distance learning facilities. A consortium of colleges in the Chicago suburban area are now offering distance learning courses in fields where the potential student interest is typically too small to make offering a course at a single campus site economically feasible. A friend recently told me about his niece who had enrolled in a course at the local community college. As she entered the classroom, searching about for an empty desk, she heard a voice saying, "please find a seat and tell us who you are". Somewhat startled, the young woman looked around trying to locate the source of the voice. The voice again requested, "young woman please find a seat and tell us something about yourself". Suddenly my friend's niece realized that the voice, that of the instructor, was connected to the image of a figure on a large screen in the front of the classroom. The instructor who was teaching this course was located in another classroom 30 miles away. The students in the class, all equally visible and capable of communicating with all other participants--students and the instructor—were in classrooms in three separate geographic locations. One classroom converted into a distance learning facility makes fully functioning courses held simultaneous in many locations possible. Today, state systems of higher education are spending millions to expand distance learning facilities. Many colleges are presently developing new ways to use the Internet and other distance learning technologies to share courses and to administer joint degree programs.

Cost conscious state governments are looking to distance learning technology as a means to provide economical college credentialing and instruction. Eleven western states are currently in the final planning stages for a multi-state virtual university.

The great advantages of distance learning is that students have access to courses of interest regardless of their location or the location of the school. There is no longer a need to travel to a distant campus. The school becomes a delivery or access point for a curriculum that is potentially unrestricted by academic structures. One potential danger associated with distance learning is that large classes can become even larger. Several colleges might decide to share one academic department. Entire academic departments could disappear over night. Faculty on individual campuses could be replaced with academic mentors that assist students with individual learning problems but provide no classroom instruction. One mentor can potentially replace a great number of teaching faculty. We should be especially concerned when colleges have a minimal philosophical commitment to portions of their own academic programs. The use of distance learning can become a convenient and economical way to appease accrediting agencies. Schools that are currently facing financial pressures may find that distance learning is the key to survival, but for faculty, the future with distance learning will likely mean more students and fewer teaching positions available.

Faculty will also find themselves housed in academic units that are unlikely to closely resemble those of the present and past. The structure of the academic department is already breaking apart. Many faculty are choosing to identify their colleagues more in terms of what technology they use to teach and how they pursue professional achievement rather than by allegiance to a traditional academic discipline. In some institutions academic departments still exist but no longer hold authority over programs and curriculum. Colleges that share curriculum

through distance learning are already in the process of creating new academic units in which closest faculty colleagues, in terms of common professional interest, are quite possibility people who have never met face to face. The students in a distance learning oriented institution might develop the close relationships with students they only see on a video screen and talk to through a listserv or e-mail. So much for our traditional notions of social interaction and residential college life. Even commuter campuses have student centers where people meet and talk.

Henry Mintzberg (1983) points out that teaching has always been relatively low tech activity. Schools have typically developed with a minimal technocratic structure. The work of college teachers is changing and the emerging tasks are more technical. Generally the few technical professionals in higher education have had little power and influence over university affairs. Information technology specialists from microcomputer technicians to systems development engineers are present in increasing numbers on almost every college campus. On a small campus the growth of an IT department will likely be at the expense of faculty or administrative staff positions. The status and influence of IT specialists within the academic organization is likely to continue to be less than teaching faculty but it appears to be steadily increasing. As any faculty member who has ever experienced a computer equipment breakdown in their classroom or office knows, the computer technician has considerably more informal power than their position on the organizational chart suggests. More important, IT specialists are increasingly found on the college president's or provost's cabinet, where they have formal authority and influence. Matters concerning the deployment and allocation of IT are always technically complex and typically result in major financial expenditures. The perspective of an expert who understands higher education and IT is essential to wise decision-making.

Nevertheless, the influence of faculty over the higher education curricula seems to be diminishing, at a time when it is most needed.

John Seely Brown and Paul Duguid (1996) maintain that today's campuses are schizophrenic combinations of high-powered computational infrastructures and highly conventional institutional practices. America's colleges and universities have basically conservative organizational structures. Academic systems like tenure are a guarantor that radical change will not occur too quickly within the system. The university has been insulated from cultural fads by systems that provide for evolution rather that revolution. The structure of higher education is not totally resistant to external pressure for change. Higher education was radically changed in medieval Europe by the printing press. The structure of higher education early in the next century is likely to change as dramatically because of information technology as it did with the advent of the printing press. Unfortunately much of this change will be driven by financial concerns, not by a concern for the best use of technology.

The notion that new technology can be integrated into the structure of higher education is at best wishful thinking. Information technology will not integrate into existing structures, rather it will transform the structure of higher education into a form that is impossible to predict.

Human Resources and Information Technology

I was told a story about a faculty member who had a networked desktop microcomputer plunked in his office several years ago. The faculty person didn't request the microcomputer, rather it had became a standard piece of faculty office equipment at this particular college. The tale continues that the faculty member recently asked a colleague to explain how E-mail might be accessed. When the colleague accessed the account there were hundreds of messages that had accumulated over three or four year period. Apparently this faculty member had no idea how a

microcomputer could be used to do anything other than basic word processing. I'm not at all certain that this is a creditable tale. It sounded unlikely to me, but it betrays both a condescending attitude on the part of the story teller toward a colleague who was not functionally literate in a technical sense and it illustrates a major potential problem. This college had forgotten that some people are reluctant to admit that they are not computer literate. Many people are intimidated by new technology. While most faculty have been using computers to assist with work for many years, we forget that the computer is not all that user friendly. Most of the computer processes and applications that are associated with developing and using instructional technology require a high level of knowledge and skills. Faculty can easily be classified into two groups: Faculty that develop and use IT and faculty who are disinterested, intimidated, or opposed to IT. These two groups do not appear to be engaging in much discussion or dialog. Contributing to a gap in communication, IT supporters have developed some fairly inaccessible jargon. One of my colleagues calls those inclined to use IT wire heads. It seems, from my vantage point, that the wire head folks talk most often with other wire heads. I am reminded weekly that my colleagues, representing the two groups, are talking past one another when they are talking at all. Communication, from a human relations standpoint, is always a major concern. Effective organizations are characterized by good communication among stakeholders. Faculty, students, administration, and trustees continually struggle to understand and to be understood. Unless we know the basic assumptions that are held by others there is no opportunity to build a common ground. Edgar Schein (1993) points out that improvement of our organizations' thought processes depend on a common formulation of the problems. Colleges and universities simply can not afford to allow internal groups to develop that are unable or unwilling to establish a dialog. Many communication problems are most likely transitional. Almost all faculty and students are

more technologically literate than they were just a few years ago. Nevertheless, any breakdown of communication within an organization should be viewed as a potential threat.

Technology can create alienation and isolation but it can also be used to bring individuals together. IT is already used on numerous campuses to improve interpersonal communications. At my university, a listserv is maintained for the purpose of establishing discussion or dialog concerning university policies and practices. Organizations can use technology to make more information accessible to more people. In the academic world the withholding and dispensing of information has created relationships based on power, status, and institutional hierarchy. More equal access to information creates a foundation for a more participatory community. Students no longer have to deal with the dehumanizing process of traveling from administrative office to administrative office to obtain information. Long lines for registration are rapidly becoming a thing of ancient academic lore. From the stand point of the constituencies and the economics of operation the replacement of numerous office clerks all located in separate offices with one clerk and a computer or just a computer is a major leap for campus communication. Students at many schools walk up to kiosks and access information including transcripts, bill balances, and course schedules. Many students search library system catalogs and place interlibrary book requests from their dorm room or apartment. Faculty members exchange the latest data or theory with colleagues a few miles or a thousand miles away with almost equal speed. Old relationships are lost; new relationships are formed. The same technology that can isolate can bring new togetherness.

The Political Dimension and Information Technology

Ronald Heifetz (1994) from Harvard's Kennedy School of Government reminds us that leadership is difficult and risky. "You have to ask people to sustain a loss. It may be that the loss

is only temporary and that the future will be even better. But in the current moment, when people are experiencing the pressure to change, those future possibilities are simply possibilities." This is especially true in higher education. No one has produced a credible vision of the future where all current stakeholders will survive and prosper. For the foreseeable future, academics will struggle over scarce resources. Few academics will consent to sustaining a major loss for the benefit of another department or even for the institution as a whole. The colleges and departments with adequate information technology are more likely to survive and prosper than those academic units who fail to obtain technology. Our current modes of planning and budgeting guarantee this desperate struggle will occur among groups of academics on almost every campus on an on-going basis. The current practices are typically based on making the best case for the importance of individual department or program needs. Simply stated, resource allocation in higher education is almost always a highly competitive, politicized process. The struggle to obtain IT has already resulted in undeclared warfare among academic units on many campuses. Making the case for resource allocations is among the most political processes in the modern college or university. Seldom, if ever, do these processes reach a stage of dialog or consensus. In many institutions the budget is related directly to the strategic planning process. Typically this practice merely extends the political haggling to another level of engagement. Few schools have developed new resource allocation procedures that deal with the increased competition created by the perceived need for more and better technology.

Colleges and universities, both private and public, are accustomed to viewing sister institutions as competitors. Throughout the history of higher education in America the academic community relationship has been strained by competition among institutions for financial resources and for qualified students. For many colleges, joining in a distance learning consortia is

the only solution to wasteful competition. Yet, most schools remain reluctant to join with other schools. An independent curriculum that belongs to the faculty is still the norm at most institutions of higher learning. For decades, colleges have been marketing the unique qualities of their particular institution to their constituents. What might account for the differences in tuition and fees, should colleges enter arrangements where a virtual curriculum is shared among various student bodies? What advantages will the college that charges over twenty thousand dollars for tuition each year claim over a school that charges less than a thousand? In spite of the difficulties, some colleges, both private and public, have already entered into consortia to share resources. The decision to give up or share control of segments of the curriculum requires a high level of trust among institutions where only competition formally existed. These schools are, of necessity, dealing with the issues concerning institutional independence and interdependence. Unfortunately, faculties are sometimes excluded from the discussions. The curriculum of the virtual university could be influenced more by the needs of corporations than by faculty.

Private colleges with great financial resources are moving at an increasing pace to implement information technologies on their campuses. Some campuses will not have sufficient financial resources to stay competitive. Although there are many small colleges that have continued to operate for decades in spite of continuing predictions of their eminent demise, the next ten years is likely to be a period where institutional survival will be even more difficult. Public colleges and universities are having some success convincing their respective external constituencies that support of IT initiatives will lead to more cost effective higher education in the foreseeable future. Private schools are not without supporters but their struggle for essential dollars will become increasing more desperate as the college population continues to shift from private schools to frequently overburdened public schools.

Competition for resources within institutions creates an atmosphere where organizational cohesion is even more difficult to foster. Deciding that one program will move forward with IT implementation faster than another can disadvantage portions of the academic program. Attempting to incrementally spread IT resources, somewhat equally, across programs and departments can result in a too-little-too-late condition for all areas of the curriculum. Are the high tech areas of the curriculum guaranteed survival by the marketplace, while traditional areas of the curriculum languish without dollars? Are rich institutions guaranteed to become richer while the poorer colleges and universities are forced to give up their autonomy or simply die?

The Culture of Higher Education and Information Technology

The cultural perspective recognizes that higher education is a unique culture with symbols that signify values underlying unwritten codes of behavior. Each institution develops a culture similar to the cultures in colleges and universities with similar characteristics. We speak of state university culture or art school culture or liberal arts culture. Sometimes we refer to the culture as a mentality—the state university mentality. Within these generality patterns of cultural behavior, even more unique cultural behavior develops. Faculty culture, student culture, and administrative culture both respond to and contribute to each another (Weis,1985).

Clearly, information technology will continue to contribute to changes in the culture of higher education. Cultures are most affected by dramatic changes in key roles. The teacher centered classroom has always been the norm. The faculty member was both the designer and delivery system. Even in classrooms where active learning strategies are used, the teacher is typically the director of learning activity. Information technology will transform that role. The faculty member in the future will be much less likely to design learning activities and deliver instruction. When the role of the college teacher is altered the faculty culture changes. When the

faculty culture changes student and administrative cultures are also changed. Information technology can change the manner in which we think and behave both as individuals and as cultural groups.

Information technology also has the potential to level out the distinctive cultural character of higher education institutions. The cultural values of the community college, the liberal arts college, and the research university are likely to be less unique in the future because the boundaries separating these institutions are likely to be less distinct or even dissolve.. Information technology also has the power to level out the cultural distinctions between the layers of education. Perhaps most students will stay at home during their first years of college, choosing to study at an economical virtual college. Students at various schools might use the same packaged courses to fulfill requirements, thus creating a more universal college curriculum. Students at community colleges can "chat" from home with students studying at far distant research universities. There are many possibilities, some are wondrous, but there is also the possibility that the greatest strength of American higher education, its diversity, will be greatly diminished.

The physical presence of information technology is a new powerful academic symbol. The stately collegiate style architecture with red brick and white columns, the pastoral quadrangles, the football stadium, and the ultramodern science building are all symbols of higher education's power and stability. In the past, the art collection or rare books collection also represented or signified institutional stability. Although collections of precious objects still signifies institutional wealth and status, the display of electronic technology signifies stability and power plus institutional commitment to a modern spirit and progressive ideas. Information technology has great power as a symbol because few symbols can simultaneously signify both conservative status and a progressive spirit. The existence of row after row of shiny new meager- megahertz

microcomputers sends a clear message that everything at Technology U. is modern—the best available. For many people the presence of modern high quality IT on a campus signifies that the teaching and learning process is also high quality. President Clinton usually includes a line in his campaign stump speeches that expresses his desire for a computer in every classroom with access to the Internet and the "finger tips of every child on the future". Clinton's language is symbolic. A computer with Internet access in every classroom is an idea unrelated to quality education unless one infers that something educational will result because of the computer that will cause many children to learn more or learn more effectively. Clinton knows full well that the inference is there.

Indeed, many studies suggest that information technology is being used to improve classroom instruction. Yet the most compelling rationale for implementing IT in higher education, at present, is more symbolic than its value for improving the quality of educational experience. In the competition for qualified students, the perception that IT is an essential means to achieve educational quality is more important than the reality. The reality is likely to be that the relations between students and faculty is still the key factor in defining quality education.

Conclusion

There is a mind-set that informs our belief that new technology will make the future a better place. Our collective faith in the ultimate goodness of our technology goes far beyond any scientific basis for belief—it is not rational. Technology solves some problems while creating new problems. The movement toward the widespread use of information technology in higher education seems to take on a life of its own. Little time will be allocated for considering what is to be gained as opposed to what might be lost. Even upon serious and informed reflection, technological change is often so profound that it is not possible to even imagine the outcomes. Information technology does not merely create new ways for doing existing work more

efficiently, it creates new work that did not exist before the technology was developed. Information technology is not limited to enhancing education, it transforms the ways in which we think about the process of education. We will both like and dislike transformational aspects of the IT age in higher education. We can resist or we can join the movement with skepticism or with full faith. The choice to avoid altogether does not appear to be a realistic option. I hope that this paper will stimulate consideration of the impact of IT on the structural, human resource, political and cultural aspects of colleges and universities. The most productive use of any technology is surely the most thoughtfully considered implementation.

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